Claims

1.   A code division multiple access downlink receiver for providing wireless communication via a wireless channel between a base station and a mobile station in which the receiver is implemented, the receiver comprising:

5   a plurality of subchannels whereof each conveys at least one signal received from the base station;

a cell searcher for receiving signals in the plurality of subchannels and retrieving therefrom a common code relating to a cell;

a code generator for generating a set of common and dedicated codes relating to

10   at least one communication channel using the output of the cell searcher;

a plurality of equalizers for receiving the code generator output and equalizing the received signals in the plurality of subchannels, wherein each of the plurality of equalizers includes a plurality of filters wherein each of the plurality of filters corresponds to each of the plurality of subchannels

15   wherein the length of each of the plurality of filters is lesser than the length of each of the plurality of subchannels.

2.   The receiver as in claim 1, wherein each of the plurality of equalizers is provided a reference timing for operation.

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3.   The receiver as in claim 2, wherein each of the plurality of equalizers is of length G determined by:

$$G \geq (L-1)/(M-1)$$

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wherein L is the length of one of the plurality of subchannels and M is the number of the plurality of subchannels.

4.   The receiver as in claim 3, further comprising a time alignment means for

30   performing time alignment on one of the output from the plurality of equalizers and the received signals in the plurality of subchannels, wherein when time alignment is performed on the output from the plurality of equalizers each of the plurality of

equalizers is provided with a unique reference timing for operation, and when time alignment is performed on the received signals the plurality of equalizers equalize time-aligned received signals and the plurality of equalizers is provided with the same reference timing for operation.

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5.   The receiver as in claim 4, further comprising a combiner to combine one of the outputs from the time-alignment means and the plurality of equalizers.

6.   The receiver as in claim 5, further comprising a despreader to despread the combined outputs from the combiner.

7.   The receiver as in claim 4, further comprising a despreader to despread one of the outputs from the time-alignment means and the plurality of equalizers.

8.   The receiver as in claim 7, further comprising a combiner to combine the despread outputs from the despreader.

9.   The receiver as in claim 4, wherein each unique reference timing is dependent on the operation of a path searcher, wherein the path searcher performs a search for multiple paths by which the at least one signal arrives at the receiver using the received signals in the plurality of subchannels and generates each unique reference timing therefrom.

10.   The receiver as in claim 4, wherein each unique reference timing is predetermined.

11.   The receiver as in claim 4, further including an intelligent cluster analyzer, wherein each unique reference timing is dependent on the operation of the intelligent cluster analyzer wherein the intelligent cluster analyzer divides the received signals into at least one ray cluster and generates each unique reference timing.

12.   The receiver as in claim 11, wherein the intelligent cluster analyzer further determines the number of the plurality of equalizers.

13.   The receiver as in claim 12, wherein the intelligent cluster analyzer further determines the length of the plurality of filters according to:

$$M\widetilde{G} \geq P(Q + \widetilde{G} - 1)$$

wherein P is the number of the at least one ray cluster and Q is the maximum channel length relating to the at least one ray cluster.

14.   The receiver as in claim 13, further including a power-delay profile estimator for estimating the power delay profile of the wireless channel.

15.   The receiver as in claim 14, wherein the intelligent cluster analyzer generates each unique reference timing, and determines the number of the plurality of equalizers and length of the plurality of filters using the power-delay profile of the wireless channel estimated by the power delay profile estimator.

16.   The receiver as in claim 15, wherein the power-delay profile estimator is capable of estimating power-delay profiles of the wireless channel relating to hilly terrains, typical urban, or equalization test models.

17.   In a code division multiple access downlink receiver, a method for providing wireless communication via a wireless channel between a base station and a mobile station in which the receiver is implemented, the method comprising the steps of:

        providing a plurality of subchannels whereof each conveys at least one signal received from the base station;

        receiving using a cell searcher signals in the plurality of subchannels and retrieving therefrom a common code relating to a cell;

        generating using a code generator a set of common and dedicated codes relating to at least one communication channel using the output of the cell searcher;

        using a plurality of equalizers for receiving the code generator output and equalizing the received signals in the plurality of subchannels, wherein each of the

plurality of equalizers includes a plurality of filters wherein each of the plurality of filters corresponds to each of the plurality of subchannels

wherein the length of each of the plurality of filters is lesser than the length of each of the plurality of subchannels.

18.   The method as in claim 17, further comprising the step of providing each of the plurality of equalizers with a reference timing for operation.

19.   The method as in claim 18, further comprising the step of determining the length G of each of the plurality of equalizers by:

$$G \geq (L-1)/(M-1)$$

wherein L is the length of one of the plurality of subchannels and M is the number of the plurality of subchannels.

20.   The method as in claim 19, further comprising the step of performing time alignment using time alignment means on one of the output from the plurality of equalizers and the received signals in the plurality of subchannels, wherein when time alignment is performed on the output from the plurality of equalizers each of the plurality of equalizers is provided with a unique reference timing for operation, and when time alignment is performed on the received signals the plurality of equalizers equalize time-aligned received signals and the plurality of equalizers is provided with the same reference timing for operation.

21.   The method as in claim 20, further comprising the step of combining using a combiner one of the outputs from the time-alignment means and the plurality of equalizers.

22.   The method as in claim 21, further comprising the step of despreading using a despreader the combined outputs from the combiner.

23. The method as in claim 19, further comprising the step of despreading using a despreader one of the outputs from the time-alignment means and the plurality of equalizers.

5 24. The method as in claim 23, further comprising the step of combining using a combiner the despread outputs from the despreader.

25. The method as in claim 20, wherein the step of providing each unique reference timing is dependent on the operation of a path searcher, wherein the path searcher
10 performs a search for multiple paths by which the at least one signal arrives at the method using the received signals in the plurality of subchannels and generates each unique reference timing therefrom.

26. The method as in claim 20, wherein the step of providing each unique reference
15 timing comprises the step of providing each unique reference which is predetermined.

27. The method as in claim 20, further comprising the step of performing intelligent cluster analysis using an intelligent cluster analyzer, wherein each unique reference timing is dependent on the operation of the intelligent cluster analyzer wherein the
20 intelligent cluster analyzer divides the received signals into at least one ray cluster and generates each unique reference timing.

28. The method as in claim 27, wherein the step of performing intelligent cluster analysis using the intelligent cluster analyzer comprises the step of further determining
25 the number of the plurality of equalizers.

29. The method as in claim 28, wherein the step of performing intelligent cluster analysis using the intelligent cluster analyzer further comprises the step of further determining the length of the plurality of filters according to:

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$$M\widetilde{G} \geq P(Q + \widetilde{G} - 1)$$

wherein P is the number of the at least one ray cluster and Q is the maximum channel length relating to the at least one ray cluster.

30.   The method as in claim 29, further including the step of estimating the power-delay profile of the wireless channel using a power delay profile estimator.

31.   The method as in claim 30, wherein the step of performing intelligent cluster analyzer using the intelligent cluster analyzer further comprises the steps of:
        generating each unique reference timing, and
        determining the number of the plurality of equalizers and length of the plurality of filters using the power-delay profile of the wireless channel estimated by the power delay profile estimator.

32.   The method as in claim 31, wherein the step of estimating the power-delay profile comprises the step of estimating power-delay profiles of the wireless channel relating to hilly terrains, typical urban, or equalization test models.